EXHIBIT C

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United States Patent [19]

Heller et al.

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[54] **SENSORY AND CONTROL SYSTEM FOR LOCAL AREA NETWORKS**

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[51] **Int. Cl.**[6] **H04Q 1/00**

[52] **U.S. Cl.** **340/825.35**; 340/825.44; 342/451

[58] **Field of Search** 340/825.36, 825.49, 340/825.35; 342/450, 451, 463

[56] **References Cited**

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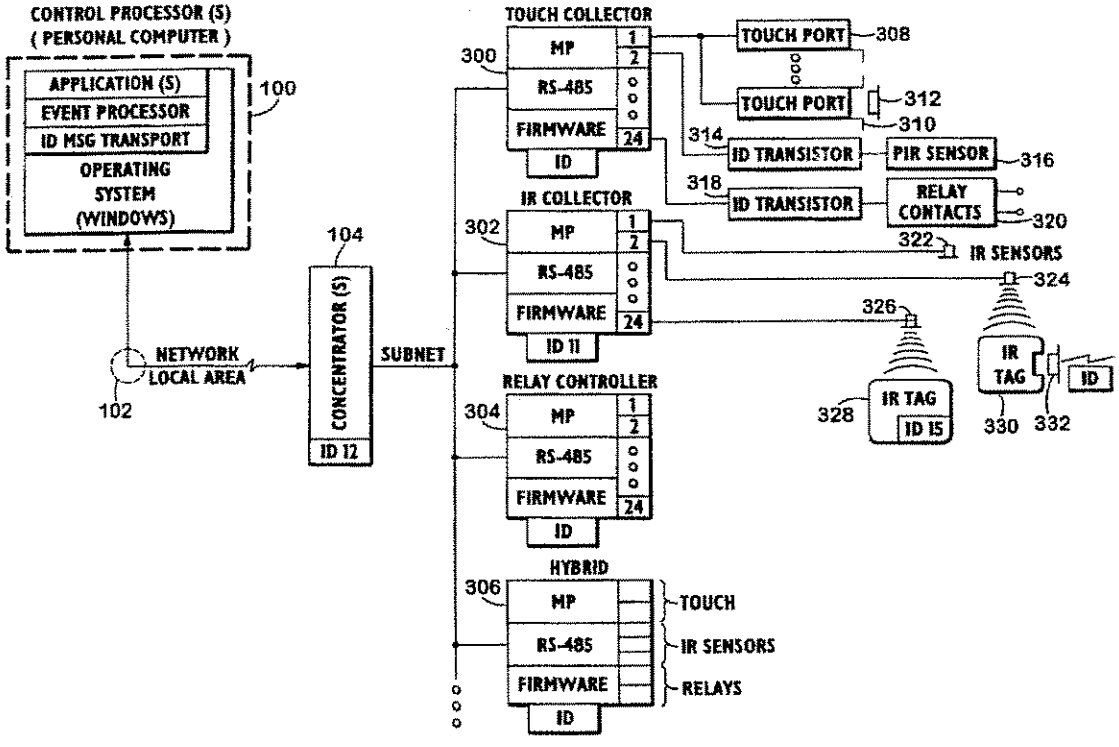
[57] **ABSTRACT**

An object location, control, and tracking system is implemented using an object identifier variable-based protocol such as SNMP. Infrared sensors, touch memory ports, passive infrared sensors, and external device controllers are all accessed using object identifier variables and in this way stimuli events are reported to a computer on the network, and the external devices are controlled responsive to the stimuli.

19 Claims, 9 Drawing Sheets



-continued

APP 1

```
                                                    unsigned int getMods, unsigned char far * ipAddr );
int FAR PASCAL_export snNextOid( HWND userWindow, char far * oidStr,
                                                    unsigned char far * ipAddr );
int FAR PASCAL_export snSetOid( HWND userWindow, char far * oidStr,
                                                    unsigned int valType, unsigned int valLen, unsigned char far * val,
                                                    unsigned char far * ipAddr ) ;
int FAR PASCAL_export snTrapOid( HWND userWindow, char far * oidStr,
                                                    unsigned char far * ipAddr ) ;

/*
    all of these next routines return the length of the requested field from
    the pdu and store in the pointer the value
/*
#ifdef_SNOIDS
int FAR PASCAL_export snPduAck( PDU * pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snWotOid( PDU * pdu, unsigned int seqNo, char far * oidStr ) ;
int FAR PASCAL_export snWotRawOid( PDU * pdu, unsigned int seqNo, unsigned char far * roid ) ;
int FAR PASCAL_export snWotValType( PDU * pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snWotVal( PDU * pdu, unsigned int seqNo, unsigned char far * val ) ;
int FAR PASCAL_export snWotIPAddr( PDU * pdu, unsigned int seqNo, unsigned char far * ipAddr ) ;
int FAR PASCAL_export snWotPduType( PDU * pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snWotErr( PDU * pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snWotErrX( PDU * pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snTagRep( PDU * pdu, unsigned int seqNo, TagReport far * tr, unsigned int which ) ;
int FAR PASCAL_export snStimulusReport( PDU * pdu, unsigned int seqNo,
    char far * channel,
    char far * collectorId,
    char far * ipAddr,
    char far * stimulusId,
    char far * receptorClass,
    char far * qualifiers,
    unsigned int which ) ;
#else
int FAR PASCAL_export snPduAck (LONG pdu, unsigned int seqNo) ;
int FAR PASCAL_export snWotOid( LONG pdu, unsigned int seqNo, char far * oidStr ) ;
int FAR PASCAL_export snWotRawOid( LONG pdu, unsigned int seqNo, unsigned char far * roid ) ;
int FAR PASCAL_export snWotValType( LONG pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snWotVal( LONG pdu, unsigned int seqNo, unsigned char far * val ) ;
int FAR PASCAL_export snWotIPAddr( LONG pdu, unsigned int seqNo, unsigned char far * ipAddr ) ;
int FAR PASCAL_export snWotPduType( LONG pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snWotErr( LONG pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snWotErrX( LONG pdu, unsigned int seqNo ) ;
int FAR PASCAL_export snTagRep( LONG pdu, unsigned int seqNo, TagReport far * tr, unsigned int which ) ;
int FAR PASCAL_export snStimulusReport( LONG pdu, unsigned int seqNo,
    char far * channel,
    char far * collectorId,
    char far * ipAddr,
    char far * stimulusId,
    char far * receptorClass,
    char far * qualifiers,
    unsigned int which ) ;
#endif
/* snOIDtoDDD - converts an ASN1 encoded OID to a dot-deliminated decimal
    string */
unsigned int FAR PASCAL_export snOIDtoDDD ( unsigned char oidLen, unsigned char far * oid,
    unsigned char far * ddd )       ;
#define WM_SNOIDRESP        (WM_USER+1)
#define WM_SNOIDTRAP        (WM_USER+2)
#ifdef_cpluspius
}
#endif
```

What is claimed is:

1. An object location and tracking system for tracking infrared transmitters that transmit identifying codes, comprising:

a computer network for passing messages;

a computer connected to said network, said computer including means for sending and receiving messages over said computer network in a variable-based protocol that implements object identifier variables;

a plurality of infrared sensors for receiving transmitted identifying codes from the infrared transmitters, said plurality of infrared sensors providing signals containing the transmitted identifying codes; and

interface circuitry coupling said plurality of infrared sensors to said computer network, said interface circuitry including means for providing to said computer network object identifier variables in the variable-based protocol corresponding to the transmitted identifying codes received from said signals from said plurality of infrared sensors.

2. The object location and tracking system of claim 1, wherein the variable-based protocol that implements object identifier variables is Simple Network Management Protocol (SNMP).

3. The object location and tracking system of claim 2, wherein said interface circuitry appears on said computer

network as an SNMP server and wherein said computer appears on said computer network as an SNMP client.

4. The object location and tracking system of claim 1, wherein said interface circuitry further comprises:

a subnetwork for passing messages;

controller circuitry connected to said plurality of infrared sensors and connected to said subnetwork, said controller circuitry including means for sending messages containing the transmitted identifying codes over said subnetwork; and

concentrator circuitry connected to said subnetwork and connected to said computer network, said concentrator circuitry including means for providing to said computer network object identifier variables in the variable-based protocol in response to messages containing the transmitted identifying codes sent by said controller circuitry.

5. The object location and tracking system of claim 1 for further tracking the location of registered serial number devices providing unique identifying code, further comprising:

receptor circuitry with a physical receptor, said receptor circuitry providing a unique identifying signal representing the unique identifying code of a registered serial number device placed in said physical receptor;

said interface circuitry further coupling said receptor circuitry to said computer network, said interface circuitry further including means for providing to said computer network object identifier variables in the variable-based protocol corresponding to the unique identifying signal provided by said receptor circuitry.

6. The object location and tracking system of claim 5 for further providing responses to transmitted identifying codes, further comprising:

control circuitry coupled to said network, said control circuitry implementing object identifier variables and means for controlling external physical events responsive to said object identifier variables.

7. The object location and tracking system of claim 6, wherein said computer further comprises:

means for setting object identifier variables controlling the external physical events responsive to receiving object identifier variables indicating presence of a infrared transmitter.

8. The object location and tracking system of claim 1 for further providing responses to transmitted identifying codes, further comprising:

control circuitry coupled to said network, said control circuitry implementing object identifier variables and means for controlling external physical events responsive to said object identifier variables.

9. The object location and tracking system of claim 8, wherein said means for controlling external physical events further comprises:

an addressable transistor driving a light emitting diode.

10. The object location and tracking system of claim 8, wherein said means for controlling external physical events further comprises:

an addressable transistor driving a sounder.

11. The object location and tracking system of claim 8, wherein said means for controlling external physical events further comprises:

a relay controller.

12. The object location and tracking system of claim 8, wherein said computer further comprises:

means for setting object identifier variables controlling the external physical events responsive to receiving object identifier variables indicating presence of a infrared transmitter.

13. A method for tracking and locating objects in a system with a computer network, a computer connected to the computer network, infrared sensors, and interface circuitry connecting the computer network to the infrared sensors, the infrared sensors being adapted to receive unique identifying codes from infrared transmitters, comprising the steps of:

providing object identifier variables in the interface circuitry, said object identifier variables adapted for being communicated over the computer network in a variable based protocol;

receiving in one of the infrared sensors a transmission from one of the infrared transmitters containing a unique identifying code;

sending the received unique identifying code from the infrared sensor to the interface circuitry;

providing the unique identifying code in the interface circuitry to the computer network in association with an object identifier variable; and

receiving in the computer the unique identifying code from the network by accessing its associated object identifier variable.

14. The method of claim 13 further comprising the step of:

sending an inquiry for the object identifier variable from the computer to the interface circuitry over the network; and

wherein said step of providing the unique identifying code in the interface circuitry to the computer network does so responsive to said sending an inquiry.

15. The method of claim 13, wherein said object identifier variables are provided in SNMP format.

16. The method of claim 13 also for providing physical responses and the system also having an external device controller, further comprising the steps of:

sending a message from the computer to the external device controller, the message containing an object identifier variable associated with a channel of the external device controller instructing the external device controller to activate the channel, said message sent in response to said unique identifying code provided by the interface circuitry to the computer network;

activating in the external device controller the channel contained in the object identifier variable in response to receiving said message sent by the computer.

17. The method of claim 13, the system further including a physical receptor for a registered serial number device with unique identifying code coupled to the computer network by the interface circuitry, further comprising the steps of:

receiving the registered serial number device's unique identifying code in the physical receptor;

providing the registered serial number device's unique identifying code to the computer over the computer network in conjunction with an object identifier variable identifying the physical receptor.

18. A method for tracking and locating objects in a system with a computer network, a computer connected to the computer network, infrared sensors, and interface circuitry connecting the computer network to the infrared sensors, the infrared sensors being adapted to receive unique identifying codes from infrared transmitters, also for providing physical

responses and the system also having an external device controller, comprising the steps of:

receiving in one of the infrared sensors a transmission from one of the infrared transmitters containing a unique identifying code;

sending the received unique identifying code from the infrared sensor to the interface circuitry;

providing the unique identifying code in the interface circuitry to the computer network;

receiving in the computer the unique identifying code from the network;

sending a message from the computer to the external device controller, the message containing an identification of a channel of the external device controller instructing the external device controller to activate the channel, said message sent in response to said unique identifying code provided by the interface circuitry to the computer network; and

activating in the external device controller the channel identified in said sending a message step in response to receiving said message sent by the computer.

19. The object location and tracking system of claim 1, wherein the interface circuitry further includes components for coupling said plurality of sensors to said computer network, and further includes means for providing to said computer network object identifier variables in the variable-based protocol corresponding to status of and control of the components.

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